12.0 SNAKE RIVER BASIN STEELHEAD ESU

12.1 BACKGROUND

12.1.1 Description of the ESU

The Snake River steelhead ESU includes all natural steelhead that occur in the Snake River Basin and certain hatchery programs which have been directly derived from native steelhead stocks. This ESU is distributed throughout the Snake River drainage system, including tributaries in southwest Washington, northeast Oregon and north/central Idaho (Busby et al. 1996). Snake River steelhead migrate a substantial distance from the ocean (up to 1,500 km) and use high elevation tributaries (typically 1,000-2,000 meters above sea level) for spawning and juvenile rearing. Snake River basin steelhead are generally classified as summer run, based on their adult run timing patterns. Summer steelhead enter the Columbia River from late June to October. After holding over the winter, summer steelhead spawn during the following spring (March to May). Inland steelhead of the Columbia River Basin, especially the Snake River basin, are commonly referred to as either A-run or B-run. These designations are based on a bimodal migration of adult steelhead at Bonneville Dam (235 km from the mouth of the Columbia River) and differences in age (1- versus 2-ocean) and adult size observed among Snake River steelhead. Arun steelhead are believed to occur throughout the steelhead-bearing streams of the Snake River Basin and the inland Columbia River; B-run steelhead are thought to be produced only in the Clearwater, Middle Fork Salmon, and South Fork Salmon Rivers (Busby et al. 1996).

With the exception of the Tucannon River and some small tributaries to the mainstem Snake River, the tributary habitat used by Snake River steelhead is above Lower Granite Dam. Major groupings of populations and/or sub-populations can be found in 1) the Grande Ronde River; 2) the Imnaha River; 3) the Clearwater River; 4) the South Fork Salmon River; 5) mainstem Salmon River tributaries between the South Fork and Middle Fork; 6) the Middle Fork Salmon River; 7) the Lemhi and Pahsimeroi valley production areas of the Salmon River and 8) upper Salmon River tributaries.

Although direct historical estimates of production from the Snake Basin are not available, the basin is believed to have supported more than half of the total steelhead production from the Columbia Basin (Mallet 1974). There are some historical estimates of returns to portions of the drainage. Lewiston Dam, constructed on the lower Clearwater, began operation in 1927. Counts of steelhead passing through the adult fish ladder at the dam reached 40-60,000 in the early 1960s (BRT 2003). Based on relative drainage areas, the Salmon River basin likely supported substantial production as well. In the early 1960s, returns to the Grande Ronde River and the Imnaha River may have exceeded 15,000 and 4,000 steelhead per year, respectively (ODFW 1991). Extrapolations from tag/recapture data indicate that the natural steelhead return to the Tucannon River may have exceeded 3,000 adults in the mid-1950s (BRT 2003). Most of the highest base counts and estimates are related to the years between 1957 and 1962. This is the period when The Dalles Dam was completed and flooded Celilo Falls (1957) which was a partial barrier to upriver migrations and was the site of intensive treaty tribal fishing. Steelhead counts at the dams in those years and the estimated escapement above Celilo Falls exceeded most

previous counts or subsequent counts until the increase of hatchery-origin fish in the 1980s (WDFW 2004).

The Technical Recovery Team (TRT) has identified 25 independent natural populations of steelhead in the Snake River Steelhead ESU and one population maintained by artificial propagation since its habitat was blocked by an impassable dam. Of the 25 natural populations, 5 have associated hatchery populations which are released to supplement natural spawning. Isolated, harvest augmentation hatchery programs are located within the geographic bounds of eight of the populations (Table 12.1).

Table 12.1. Steelhead populations identified by the TRT in the Snake River Basin ESU.

1 Tucannon River ^{1,2}	13 S Fk Salmon River
2 Asotin Creek	14 Secesh River
3 Lower Clearwater R. A-run	15 Chamberlain Creek
4 S. Fk Clearwater River ²	16 Lower Middle Fork
5 Lolo Creek ²	17 Upper Middle Fork
6 Selway River	18 Panther/Owl Creek
7 Lochsa River	19 North Fork
H-1Dworshak Hatchery/	20 Lemhi River ¹
8 Lower Grande Ronde River ¹	21Pahsimeroi River ¹
9 Joseph Creek	22 East Fork Salmon River ^{1,2}
10 Wallowa River ¹	23 Upper Main Salmon River ¹
11 Upper Grande Ronde River	24 Imnaha River ²
12 Little Salmon River ¹	25 Snake River Hells Canyon ¹

¹Natural population with associated non-ESU hatchery program ²Natural population with associated in-ESU hatchery program

12.1.2 Current Status of ESU

The Snake River Basin steelhead ESU was listed as threatened on August 18, 1997. The steelhead Biological Review Team (BRT) at the time concluded that a combination of severe declines in natural run size, lack of run-size information for individual populations, extensive habitat degradation, and a strong concern for the "pervasive opportunity for genetic introgression from hatchery stocks" warranted the listing (Busby et. al. 1996). The 2003 status review found moderate risks to the ESU in all of the VSP categories and confirmed the same threats and uncertainties listed by the 1996 status review (BRT 2003).

A majority of the BRT concluded this ESU fell in the "likely to become endangered" category, with small minorities falling in the "danger of extinction" and "not likely to become endangered" categories (BRT 2003). The BRT did not identify any extreme risks for this ESU but found moderate risks in all the Viable Salmon Population (VSP) categories with growth rate/productivity identified as the highest risk factor. The continuing depressed status of B-run populations was a particular concern. Paucity of information on adult spawning escapements to specific tributary production areas makes a quantitative assessment of viability for this ESU difficult. As indicated in previous status reviews, the BRT remained concerned about the

replacement of naturally produced fish by hatchery fish. Naturally produced fish made up 9 to 19 percent of the total run arriving at Lower Granite Dam since 1989/1990 (JCRMS, 2004, Table 17). Again, lack of key information considerably complicates the risk analysis. Although several large production hatcheries for steelhead occur throughout this ESU, relatively few data exist regarding the numbers and relative distribution of hatchery fish that spawn naturally or the consequences of such spawning if it does occur.

On a more positive note, sharp upturns in naturally produced adults have been counted at Lower Granite Dam in the last three years (Table 12.2). Since run year 2000/2001, natural adults arriving at Lower Granite Dam have ranged from 21,000 to 43,000 compared to less than 10,000 in most or the 1990s (JCRMS, 2004, Table 17). In spite of the recent increases, however, abundance in most populations for which there are adequate data are well below interim recovery targets (Lohn 2002).

Table 12.2. Steelhead Counts by Run year at Lower Granite Dam with wild steelhead estimates and goals 1984-2004 From Joint Staff Report. Hatchery fish in ESU are estimates compiled from individual HGMPs.

Run Year	Run Year Total	Wild in ESU		Wild in ESU Hatchery in ESU		Total in ESU	
		Number	Percent	Number	Percent	Number	Percent
1984-1985	104,400	24,500	23	37,628	0.36	62,128	0.60
1985-1986	116,300	26,700	23	15,002	0.13	41,702	0.36
1986-1987	130,000	22,000	17	28,175	0.22	50,175	0.39
1987-1988	71,300	25,500	36	16,812	0.24	42,312	0.59
1988-1989	87,100	21,100	24	22,768	0.26	43,868	0.50
1989-1990	131,400	25,500	19	33,353	0.25	58,853	0.45
1990-1991	56,900	9,300	16	24,776	0.44	34,076	0.60
1991-1992	99,100	17,300	17	18,520	0.19	35,820	0.36
1992-1993	128,300	19,400	15	39,000	0.30	58,400	0.46
1993-1994	59,800	7,400	12	19,836	0.33	27,236	0.46
1994-1995	47,300	7,500	16	15,343	0.32	22,843	0.48
1995-1996	79,100	8,000	10	15,243	0.19	23,243	0.29
1996-1997	83,300	7,300	9	15,637	0.19	22,937	0.28
1997-1998	87,700	8,600	10	20,122	0.23	28,722	0.33
1998-1999	70,700	9,300	13	27,769	0.39	37,069	0.52
1999-2000	73,800	12,100	16	20,018	0.27	32,118	0.44
2000-2001	116,300	21,400	18	34,178	0.29	55,578	0.48
2001-2002	269,300	40,400	15	80,002	0.30	120,402	0.45
2002-2003	222,200	43,100	19	66,011	0.30	109,111	0.49
2003-2004	180,672	45,391	25	53,672	0.30	99,063	0.55

^{1 30,000} goal established for fishery management purposes

^{2 2003-2004} run data preliminary and uncorrected raw dam counts

12.2 ASSESSMENT OF HATCHERY PROGRAMS

Steelhead hatchery production in the Snake Basin is very large and likely exceeds the combined total from the rest of the Columbia Basin. Five natural populations are affected by hatchery programs that propagated fish from within the ESU (2 of these populations also have steelhead programs not part of the ESU associated with them, see Table 12.1). Ten populations have steelhead programs that propagated fish that are not part of the ESU (two of these populations also have steelhead programs that are part of the ESU associated with them, see Table 12.1). The following sections present a summary of artificial propagation programs in the Snake River Steelhead ESU and the relationship of the hatchery programs with the natural populations.

12.2.1 Snake River Mainstem

12.2.1.1 Lyons Ferry Hatchery

12.2.1.1.1 Broodstock/Program History. The Lyons Ferry Hatchery (LFH) steelhead program is a LSRCP program established to mitigate for losses due to the four lower Snake River Dams. Hatchery releases began in 1982. The LFH program utilizes a non-endemic steelhead hatchery stock derived by importing out of ESU hatchery stocks, primarily from Wells Hatchery (Wells Stock) on the upper Columbia River and Wallowa stock (SRHR, 1991). The Pahsimeroi and Oxbow hatchery stocks were also used to a minor extent (Table 12.3). The LFH stock was established when adults began returning and were trapped on site at LFH and is not part of the ESU. The LFH stock is considered an "A" run steelhead, typical of most Columbia River stocks. The LFH Program provides adult steelhead for recreational and tribal harvest within the LSRCP compensation area (Snake River and tributaries above Ice Harbor Dam).

12.2.1.1.2 Similarity of hatchery-origin to natural-origin fish. The LFH program utilizes a non-endemic steelhead hatchery stock, that originated in part, from outside the geographical boundaries of the ESU. The program is managed as an isolated program and is not intended to be similar to any natural population in the Snake River basin.

12.2.1.1.3 Program Design. The Lyons Ferry steelhead hatchery program is designed as an isolated program with goals of providing fish for harvest augmentation. Currently, about 60,000 smolts are released on-station, but this number was previously much higher (Table 12.3). The hatchery also produces approximately 360,000 fish for release into the Touchet, Walla Walla and Tucannon rivers in SE Washington (See Tucannon and Walla Walla Basin summer steelhead HGMP's). The program emphasis has been to release smolts at 4-5 fish/pound to 1) reduce residualism, 2) produce fish that are ready to migrate quickly from the area, 3) reduce interactions with natural fish in the Snake River, 4) increase smolt-to-adult survival of the hatchery reared smolts to increase hatchery cost-efficiency, and 5) meet adult return mitigation goals. Harvest limits in the lower Snake River have been occasionally increased in an attempt to remove more harvestable hatchery fish from the system (WDFW 2002a). A large number of returning hatchery origin adults are trapped each year at LFH for broodstock (2,000-6,000 fish), most of which are eventually returned to the Snake River to provide additional harvest opportunity.

Table 12.3	3. Release of LFH Stock stee	elhead smolts directly	from LFH into the	Snake River, 1982-
2001 relea	ase years (WDFW 2002a)			

Release Year	Stock	Release Location ¹	River Kilometer	Number of smolts
1982	Wallowa	LFH	58,	27,940
1983	Wells, Wallowa	LFH	58,	138,552
1984	Wells, Wallowa	LFH	58,	138,378
1985	Wells, Wallowa	LFH, IHD, LGO	58, 35, 71	170,706
1986	Wells, Wallowa, LFH	LFH, IHD, LGO	58, 35, 71	197,350
1987	Wells, Wallowa	LFH, IHD, SM	58, 35, 10	196,361
1988	Wallowa, LFH	LFH	58	105,117
1989	LFH	LFH	58	98,504
1990	Pahsimeroi	LFH	58	43,479
1991	LFH	LFH	58	57,655
1992	LFH	LFH	58	66,688
1993	LFH, Oxbow	LFH, TEX	58, 66	247,950
1994	LFH	LFH, LGR	58, 83	119,039
1995	LFH	LFH	58	66,972
1996	LFH	LFH	58	71,942
1997	LFH	LFH	58	81,162
1998	LFH	LFH,TEX	58, 66	93,212
1999	LFH	LFH	58	87,992
2000	LFH	LFH	58	59,942
2001	LFH	LFH	58	53,551

Abbreviations are as follows: LFH-Lyons Ferry Hatchery, IHD-Ice Harbor Dam, LGO-Little Goose Dam, LGR-Lower Granite Dam, TEX-Texas Rapids (Lower Monumental Pool), SM-Mouth of Snake River.

12.2.1.1.4 Program Performance. The Lyons Ferry program has successfully met the mitigation goal of returning adult steelhead to the LSRCP project area and has established a reliable annual supply of broodstock to continue the mitigation program. Smolt-to-adult survival rate back to the Snake Basin has averaged 0.8 percent and is well above replacement rate (Table 12.4).

12.2.1.1.5 VSP Criteria

Abundance – This program produces fish that are not contributing to abundance within this ESU.

<u>Productivity</u> – There is no information.

<u>Diversity</u> – It is unknown whether this program is having any effect on diversity. The hatchery is located in the Lower Snake River well away from most of the natural production areas.

Distribution – This program has had no effect of distribution within this ESU.

12.2.1.1.6 Summary. The Lyons Ferry-Snake River program propagates fish that are not part of the ESU and is appears to be having little effect on the ESU.

Table 12.4. Recoveries and estimated smolt-to-adult return rates from LFH stock steelhead released

directly into River from LFH (1982-1997 BY)(WDFW 2002a)

Brood Year	Freeze Brand Recoveries at Lower Granite Dam SAR to LSRCP area (%)	Coded-Wire Tag Recoveries SAR to LSRCP area (%)	Coded-Wire Tag Recoveries SAR to Columbia R. (%)
1982	499 (1.02)	563 (0.41)	1,397 (1.01)
1984	· · ·	` ′	· ·
	723 (1.27)	633 (0.61)	1,284 (1.23)
1985	1,148 (1.13)	356 (0.35)	1,406 (1.38)
1986	1,601 (1.58)	1,279 (0.79)	2,253 (1.39)
1987	1,414 (1.41)	1,006 (0.96)	1,563 (1.49)
1988	350 (0.39)	829 (0.84)	1,071 (1.09)
1989	353 (0.94)	411 (0.95)	568 (1.31)
1994	581 (1.45)	1,377 (2.06)	1,559 (2.33)
1995	305 (0.52)	548 (0.76)	719 (1.00)
1996	248 (0.32)	197 (0.24)	209 (0.26)
1997	542 (0.71)	NA	NA
Mean	0.97 %	0.80%	1.25%

12.2.2 **Tucannon River**

12.2.2.1 Tucannon River Basin Artificial Propagation Programs

12.2.2.1.1 Broodstock History. The steelhead programs in the Tucannon River are operated by WDFW and funded through the LSRCP. There are two artificial propagation steelhead programs in the Tucannon River: the Lyons Ferry stock released for harvest augmentation and a local stock developed for supplementation (WDFW 2002b).

Hatchery steelhead releases using Lyons Ferry stock (not in the ESU) began in 1983 and still occurs. The Curl Lake Rearing Pond was constructed in 1984 as a satellite to Lyons Ferry Hatchery for steelhead acclimation and release. The Pond is located high up in the watershed and was used for steelhead until the mid 1990's. Since then, the Pond has been used for spring chinook salmon acclimation and release. Beginning in 1998, the release location for Lyons Ferry stock steelhead was moved to the lower Tucannon River in response to studies indicating improved survivals and to minimize the opportunity for interbreeding and competition between hatchery and natural returns (included listed spring chinook) to the basin.

Beginning with BY 2000, the WDFW began an evaluation of the feasibility of using local broodstock for the Tucannon River program. Conversion to an endemic broodstock may occur in the future, depending upon the success of the pilot program. Problems associated with trapping and rearing of the new broodstock, as well as genetic questions still need to be addressed (B.

Leland WDFW, pers. comm.).

12.2.2.1.2 Similarity of hatchery-origin to natural-origin fish. The Lyons Ferry stock used in the Tucannon program is a non-endemic steelhead, which originated in part, from outside the geographical boundaries of the ESU. The program is managed as an isolated program and is not intended to be similar to any natural population in the Snake River basin.

The Tucannon local stock is being founded from the local indigenous native fish. The program was founded from natural adults returning to the Tucannon River and has been in captivity less than one generation. These fish are believed to represent the founding Tucannon River population.

12.2.2.1.3 Program Design. The Lyons Ferry stock is designed to be an isolated harvest program. Hatchery smolts are released in the Lower Tucannon River, below most natural steelhead production areas, and where they are subject to high harvest rates. Hatchery adults are excluded from the upper river spawning areas by removal at the Tucannon Hatchery adult weir and trap. Smolt release numbers have ranged from 120,000 to 170,000 in recent years (Table 12.5).

The Tucannon local stock program was initiated with BY 2000 and is designed to evaluate performance of this stock to achieve the dual purpose of mitigation and supplementation. The program is still in early development stage with evaluations targeted at assessing this stocks performance. Natural adults are collected at the Tucannon Hatchery weir and trap. The current release goal is 50,000 smolts and the first releases occurred in 2001 (WDFW 2002c). Results from monitoring and evaluation will be used to assess whether or not to convert the entire Tucannon Basin steelhead program to the local stock, but this information is not expected for few years.

12.2.2.1.4 Program Performance

The local stock program is to new to be evaluated. WDFW has an extensive monitoring and evaluation plan which includes adults and smolt traps, snorkeling, and genetic parent-to-progeny tracing to describe the results and affects of the program.

The Lyons Ferry stock has provided some harvest opportunities with SARs typically ranging from 0.2 percent to 1.0 percent (WDFW 2002a). Hatchery smolt releases in the lower river and trap and removal of Lyons Ferry stock at Tucannon Hatchery isolates this program from the majority of steelhead habitat in the upper basin. Natural steelhead are also present below the Tucannon Hatchery, but there is no information on the effects of this intermingling.

12.2.2.1.5 VSP Criteria

<u>Abundance</u> – It is to early in the program to determine if the local stock program will increase adult abundance of the Tucannon population. The local program has increased total smolt outmigration of the combined natural and hatchery components. The Lyons Ferry stock is not part of the ESU and is not contributing to the Tucannon population abundance.

<u>Productivity</u> – The local stock program is too new to be evaluated. WDFW has an extensive monitoring and evaluation plan which includes adult and smolt traps, snorkeling, and genetic parent-to-progeny tracing to describe the results and affects of the proposed program. It is unknown what effect the non-local Lyons Ferry stock may have had on the Tucannon population productivity.

<u>Diversity</u> – The local stock program was initiated with the 2000 brood year, applies mating protocols to maximize effective breeding population, and is thought to represent the Tucannon population. The program is a moderate size and unlikely to swamp the natural population. The movement of Lyons Ferry stock to the lower Tucannon River likely has significantly reduced, but not eliminated interactions with the Tucannon population. Specific affects to the Tucannon population from Lyons Ferry stock are unknown.

<u>Distribution</u> – Tucannon River steelhead are widely distributed in the Tucannon River and the hatchery programs are thought to have a neutral affect on distribution.

12.2.2.1.6 Summary. The local stock program in the Tucannon River is designed to evaluated effectiveness of steelhead supplementation and whether this stock could be used for the LSRCP mitigation program. Movement of the Lyons Ferry stock to the lower Tucannon River has reduced interactions with the natural population. The effects on diversity and productivity of the Lyons Ferry stock on the Tucannon population is unknown.

Table 12.5. Release of LFH, Wallowa, Wells and Pahsimeroi stock steelhead smolts into the Tucannon River, 1983-2001 release years. (WDFW 2002c)

Release Year	Stock Release Location		River Mile	Number of smolts
1983	Wells	Curl Lake	40	148,275
1984	Wallowa, Wells	Curl Lake	40	195,315
1985	Wallowa	Curl Lake	40	151,609
1986	Wallowa, Wells	Curl Lake	40	141,068
1987	LFH	Curl Lake	40	162,231
1988	LFH	Curl Lake	40	161,293
1989	LFH	Curl Lake	40	160,131
1990	Pahsimeroi	Curl Lake, Marengo	40, 25	119,264
1991	LFH	Curl Lake, Marengo Br., Curl (Direct)	40, 25, 40	200,336
1992	LFH	Curl Lake, Marengo Br, Curl (Direct)	40, 25, 40	130,040
1993	LFH	Curl Lake, Marengo Br, Curl Direct	40, 25, 40	108,937
1994	LFH	Curl Lake	40	135,359
1995	LFH	Curl Lake	40	146,070
1996	LFH	Curl Lake, Marengo Br	40, 25	169,706
1997	LFH	Curl Lake, Marengo Br	40, 25	139,971
1998	LFH	Marengo Br, Enrich Br	25, 17	160,068
1999	LFH	Marengo Br	25	179,089
2000	LFH	Marengo Br, Enrich Br	25, 17	145,768
2001	LFH	Marengo Br, Enrich Br	25, 17	121,390

12.2.3 Grande Ronde River Basin Artificial Propagation Programs

12.2.3.1 Cottonwood Pond

12.2.3.1.1 Broodstock History. Cottonwood Acclimation Pond is a LSRCP facility located at the confluence of the Grande Ronde River with Cottonwood Creek at about river mile 28 on the Grande Ronde River. The pond is operated by WDFW as a satellite of Lyons Ferry Hatchery for the purpose of releasing steelhead smolts intended to support fisheries. Wallowa Hatchery steelhead stock are used at Cottonwood Pond and releases began in 1982. The Wallowa stock (currently used by both WDFW and ODFW in the Grande Ronde Basin) was originally derived in 1976 to 1978 by trapping at Ice Harbor and Little Goose Dams during the spring and by importing Pahsimeroi hatchery stock in 1979 (SRHR, 1991). The stock is considered to be a composite of both "A" and "B" run steelhead from the Snake River basin and is not part of the ESU. A permanent adult trapping site was installed in Cottonwood Creek to trap hatchery broodstock beginning in 1992. Prior to that and for a few years following, WDFW received eggs from ODFW's Wallowa Hatchery program. Cottonwood Pond now collects broodstock to support the 160,000 release.

12.2.3.1.2 Similarity of hatchery-origin to natural-origin fish. Cottonwood Pond utilizes a hatchery stock which is not part of the ESU. The program is managed as an isolated program and is not intended to be similar to any natural population in the Grande Ronde Basin. A small run of natural-origin steelhead has developed in Cottonwood Creek, apparently originating from hatchery fish (WDFW 2002d). These natural fish are passed above the Cottonwood Creek weir to spawn naturally.

12.2.3.1.3 Program Design. This program is designed as an isolated harvest program. Releases since the program began are provided in Table 12.6.

12.2.3.1.4 Program Performance. This program has averaged 2,628 adults returning to the Snake Basin since 1990 (Table 12.7) and is achieving the LSRCP mitigation goals set for this program. Adult returns are successfully homing back to Cottonwood Pond and the hatchery program appears to be isolated from important natural production areas (WDFW 2002d). The WDFW monitors hatchery performance with tagging, creel census and adult trap returns.

12.2.3.1.5 VSP Criteria

<u>Abundance</u> – This program rears a hatchery stock that not part of the ESU and does not contribute to its abundance.

<u>Productivity</u> – It is unknown if this program has had any effect on productivity of Grande Ronde Basin steelhead.

<u>Diversity</u> – It is unknown if this program has had any effect on diversity. Hatchery steelhead have not been reported from Joseph Creek, an important steelhead production area.

Distribution – This program is believed to have no effect on distribution.

12.2.3.1.6 Summary. The Cottonwood Pond steelhead program appears to be isolated from nearby natural production area, however, additional monitoring is needed to confirm.

Table 12.6 . Release of hatchery steelhead from the LFH into the Washington portion of the Grande
Ronde River, 1982-2001 release years. (WDFW 2002d)

Release Year	Stock	Release Location	River Mile	Number of smolts
1982	Wallowa	Direct Stream	25	35,155
1983				
1984				
1985	Wallowa	Direct Stream, Cottonwood AP	22, 29	149,408
1986				
1987	Wallowa	Cottonwood AP	29	200,845
1988	Wallowa	Direct Stream, Cottonwood	26, 29	220,676
1989	Wallowa	Cottonwood AP	29	222,050
1990	Wallowa	Cottonwood AP	29	239,000
1991	Wallowa	Cottonwood AP	29	252,799
1992	Wallowa	Cottonwood AP	29	213,622
1993	Wallowa	Cottonwood AP	29	291,711
1994	Wallowa	Cottonwood AP	29	273,000
1995	Wallowa	Cottonwood AP	29	206,182
1996	Wallowa	Cottonwood AP	29	249,530
1997	Wallowa	Cottonwood AP	29	250,262
1998	Wallowa	Cottonwood AP	29	252,211
1999	Wallowa	Cottonwood AP	29	268,803
2000	Wallowa	Cottonwood AP	29	274,146
2001	Wallowa	Cottonwood AP	29	215,584
2002	Wallowa	Cottonwood AP	29	182,722

Table 12.7. Estimated adult returns to the Washington Portion of the Grande Ronde River from fisheries, freeze brand recoveries at Lower Granite, and extrapolations from other coded-wire tag groups within the Snake River Basin (WDFW 2002d).

Run Year	Returns to Snake From Grande Ronde Releases
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000	1,873 1,777 3,882 2,188 2,945 4,087 3,012 2,243 1,207 1,470 4,232
11-Year Average	2,628

12.2.3.2 Wallowa River Artificial Propagation Program

- 12.2.3.2.1 Broodstock History. The Wallowa River program is the larger of the two LSRCP steelhead mitigation programs in the Grande Ronde River basin (Cottonwood Creek is the other, LSRCP 2003). The Wallowa stock originated from collections of adults during the spring at Ice Harbor Dam (1976), Little Goose Dam (1977, 1978), and embryos from Pahsimeroi Fish Hatchery in Idaho (1979). Since 1979, Wallowa stock adults returning to Wallowa Hatchery, Big Canyon satellite facility, and Cottonwood Pond (Washington) have been utilized as broodstock.
- 12.2.3.2.2 Similarity of hatchery-origin to natural-origin fish. The Wallowa program utilizes a hatchery stock which is not part of the ESU. The program is managed as an isolated program and is not intended to be similar to any natural population in the Grande Ronde Basin.
- 12.2.3.2.3 Program Design. This program is designed as an isolated harvest program intended to maintain harvest opportunities. The LSRCP compensation objective for Grande Ronde steelhead is 9,200 adults. Smolts are acclimated and released at two sites within the Wallowa drainage, at Wallowa Hatchery and the acclimation pond on Big Canyon Creek. Oregon manages the remainder of the Grande Ronde basin including Lookingglass Creek, Catherine Creek, the Upper Grande Ronde River, Minam River, Joseph Creek and the Wenaha River drainages for natural production. Natural fish are not incorporated into the broodstock. Smolt releases totaled 1.3 million in the past, but recently have been about 870,000 (ODFW 2002a).
- 12.2.3.2.4 Program Performance. ODFW monitors hatchery performance with tagging, creel census and adult trap returns. Table 12.8 summarizes recent contributions to fisheries and hatchery returns. This program is achieving mitigation goals and is at least partially successful in isolating the hatchery-origin returns from important natural production areas. There is some information that straying to other Grande Ronde natural production areas is low. This is substantiated by counts at Lookingglass Hatchery, Catherine Creek, and upper Grande Ronde traps. Very few marked hatchery fish have been found at these sites (Mike McClean CTUIR, personal communication.). There is less information concerning hatchery fish returning to the Wallowa River, however, fish released at the two acclimation sites (Wallowa Hatchery and Big Canyon) do not appear to stray between these two facilities. Wallowa hatchery steelhead are known to stray into the Deschutes River (Middle Columbia steelhead ESU) in fairly large numbers.

12.2.3.2.5 VSP Criteria

<u>Abundance</u> – This program rears a hatchery stock that is not part of the ESU and does not contribute to its abundance.

<u>Productivity</u> – It is unknown if this program has had any effect on productivity of Grande Ronde steelhead.

<u>Diversity</u> – It is unknown if this program is having any effect on diversity.

Distribution – This program is believe to have no effect on distribution.

12.2.3.2.6 Summary. The Wallowa hatchery steelhead program appears to be largely isolated and supporting harvest within the Grande Ronde Basin. This is a relatively large program (formerly 1.3 million smolts, currently 870,000 smolts annually. There is concern for strays of this stock in the Deschutes River system, but they appear to have a high homing fidelity in the Grande Ronde basin.

Table 12.8. Wallowa Steelhead hatchery program run reconstruction 1987-1997 (From ODFW 2002a).

Run		Colu	<u>mbia</u>	8	Snake		Run Year
Year	Ocean	Net	Sport	Deschutes ¹	Sport ²	Escapement ³	Total
1007.00		2.240	100	1.55	505	2.061	5 10 4
1987-88	0	2,240	133	165	595	2,061	5,194
1988-89	2	4,376	930	133	1,175	2,203	8,819
1989-90	15	2,890	804	846	4,157	2,000	10,712
1990-91	27	2,684	356	761	126	1,274	5,228
1991-92	67	4,559	1,238	2,264	4,383	2,554	15,065
1992-93	58	4,878	1,256	875	3,641	2,189	12,897
1993-94	0	2,795	1,132	417	2,951	1,346	8,641
1994-95	14	900	654	264	1,519	856	4,207
1995-96	0	1,365	1,264	380	2,403	2,476	7,888
<u>1996-97</u>	0	1,113	385	466	5,073	3,949	10,986
Mean							
Harvest/	18	2,780	815	657	2,602	2,092	8,964
Escapemo	ent						
Ave. %							
of run	0.2	31.0	9.1	7.3	29.0	23.3	100

Includes sport and Tribal C and S harvest

12.2.4 Imnaha River Basin

12.2.4.1 Little Sheep Creek Program

12.2.3.1.1 Broodstock History. The Imnaha steelhead program is part of the LSRCP program established to mitigate for losses to fisheries due to the four lower Snake River dams. This program is located on Little Sheep Creek and is operated as a satellite of Wallowa Hatchery. The broodstock originated from natural fish indigenous to Little Sheep Creek, tributary to Big Sheep Creek and the Imnaha River. The program began operations in 1982 (ODFW 2002b). Little Sheep Creek stock is identified as the appropriate stock for release into the Imnaha River drainage (IHOT, 1995). There have been no out-of-basin hatchery stocks transferred into this program. Adults are collected and spawned at the Little Sheep Creek Satellite, eggs are transferred to Wallowa Hatchery and incubated through eye-up, eyed eggs transferred to Irrigon

² Includes Snake River and Tributaries (**Program Compensation Area**)

³ Includes recoveries at hatchery weirs and strays within and outside the Snake basin (**most recoveries within Compensation Area**)

Hatchery and reared to pre-smolt stage, and then transferred back to Little Sheep Creek Satellite facility for three to four weeks of acclimation prior to release.

12.2.3.1.2 Similarity of hatchery-origin to natural-origin fish. The program utilizes endemic steelhead originating from Little Sheep Creek. Approximately 1 percent to 17 percent natural fish have been incorporated into the hatchery broodstock annually since 1988 (Table 12.9). Hatchery and natural fish are also passed above the weir to spawn naturally. Adults and smolts are also released into Big Sheep Creek, but no natural fish from this tributary are incorporated into the broodstock. The hatchery stock is part of the ESU and is representative of the Little Sheep Creek natural population (one tributary within the Imnaha Basin), but likely is not representative of the entire Imnaha Population .

12.2.3.1.3 Program Design. The Little Sheep Creek program is an Integrated Harvest program with goals that combine harvest augmentation ("to increase sport and/or commercial harvest opportunities by releasing artificially propagated salmon smolts") and supplementation ("to increase the abundance of an existing, but depleted population") (ODFW 2002b). Supplementation is defined as "the use of artificial propagation in the attempt to maintain or increase natural production while maintaining long-term fitness of the target population, and keeping the ecological and genetic impacts on non-target populations within specified biological limits" (RASP 1992).

The current smolt release goal includes 230,000 (180,000 adipose fin clipped) released into Little Sheep Creek and 100,000 (50,000 adipose fin clipped) into Big Sheep Creek (2003 U.S. v Oregon Fall Season Agreement). Adults are also released into both these tributaries.

12.2.3.1.4 Program Performance. The Little Sheep Creek program produces adults sufficient to support state and tribal fisheries as well as for supplementation. The program has established a reliable annual supply of broodstock and is self-sustaining. Natural production in Little Sheep Creek has not responded to the supplementation efforts using the Little Sheep Creek hatchery stock (LSRCP 1998). There is no information concerning the releases into Big Sheep Creek. Hatchery and naturally produced adults returning to the Little Sheep Creek facility are summarized in Table 12.9.

12.2.3.1.5 VSP Criteria

<u>Abundance</u> – The hatchery program has increased the total number of adults returning to Little Sheep Creek with the majority from the artificial propagation program. There is no information available concerning the release of hatchery smolts and adults into Big Sheep Creek.

<u>Productivity</u> – Monitoring to date indicates that natural productivity in the area affected by the Little Sheep Creek program continues to be low. The hatchery program is well above replacement and contributes to state and tribal fisheries.

<u>Diversity</u> – The propagation program is representative of the Little Sheep Creek which represents only a small proportion of the Imnaha Population. The release of this hatchery stock

into Big Sheep Creek without incorporating natural fish from that tributary puts at risk the diversity there, if in fact fish in the two streams have any differences.

<u>Distribution</u> – Steelhead are widely distributed in the Imnaha River basin. Natural steelhead are present in Big Sheep Creek and the hatchery releases into this stream are not expanding the habitat utilization. The program is likely having a neutral affect on distribution.

Table 12.9. Number of wild and hatchery adults returning to and spawned at the Little Sheep Creek facility, 1990 to 2001 (From ODFW 2002b).

denity, 1990 to 2001 (1)			Adults Passed Above the Weir to Spawn Naturally		Ac	lults Spawn	ed	
Return	Origin	Adults	Male	Female	Percent	Male	Female	Percent
Year		Counted			Wild			Wild
1988	Wild	47	14	18		6	6	
	Hatchery	808	189	223	7.2%	109	165	4.2%
1989	Wild	56	10	16		4	20	
	Hatchery	306	31	121	14.6%	24	109	15.3%
1990	Wild	57	7	14		13	23	
	Hatchery	924	293	302	3.4%	144	156	10.7%
1991	Wild	29	6	8		4	9	
	Hatchery	366	23	18	25.5%	129	121	4.9%
1992	Wild	128	37 ¹	38		25 ¹	33	
	Hatchery	661	52	57	40.8%	188	144	14.9%
1993	Wild	99	17	60		4	18	
	Hatchery	1773	60	17	50.0%	154	116	7.5%
1994	Wild	53	21 ¹	20		15 ¹	8	
	Hatchery	141	19 ²	17	53.2%	20^{2}	94	16.8%
1995	Wild	17	3 ³	10		1 ³	4	
	Hatchery	278	28	6	27.7%	101	95	2.5%
1996	Wild	47	22 ⁴	19		6 ⁴	6	
	Hatchery	443 ⁵	36	32	37.6%	108	153	4.4%
1997	Wild	29	9	15		2	2	
	Hatchery	937	32	21	31.2%	186	186	1.1%
1998	Wild	33	7	18		2	6	
	Hatchery	686	44	72	17.7%	198 ⁶	346	1.3%
1999	Wild	11	2	3		3	3	
	Hatchery	332 ⁷	42	33	6.3%	88	124	2.8%
2000	Wild	77	36 ⁸	23		17 ⁸	14	
	Hatchery	443 ⁹	114	106	21.1%	114	106	12.4%
2001	Wild	127	37 ¹⁰	74		19 ¹⁰	16	
	Hatchery	1227	330	344	14.1%	112	93	14.6%

Includes 12 wild males spawned and released

² Includes 10 hatchery males live spawned and released above weir

³ Includes 1 wild male spawned and released

⁴ Includes 6 wild males spawned and released

Includes 22 males and 46 females outplanted to local ponds.

⁶ Produced 1,598,340 green eggs.

⁷ Includes 25 males and 17 females released into Big Sheep Creek

⁸ Includes 13 wild males spawned and released.

Includes 55 males and 83 females released to Big Sheep Creek

¹⁰ Includes 8 wild males spawned and released.

12.2.3.1.6 Summary. The Little Sheep Creek program appears to have achieved its first goal of supporting fisheries, but has had little or no success to date increasing natural production. There is some risk of losing any unique characteristics that may be present in Big Sheep Creek steelhead with the one way gene flow from the hatchery.

12.2.5 Clearwater River Basin Artificial Propagation Programs

Steelhead hatchery releases into the Clearwater Basin are managed under two programs; the LRSCP and Dworshak Dam mitigation. The Dworshak mitigation program was developed by the US Army Corps of Engineers as compensation for losses due to Dworshak Dam, an anadromous block that cuts off the North Fork of the Clearwater River. The LSRCP program provides compensation for losses due to construction of the lower Snake River dams. The Lochsa and Selway sub basins are managed for natural production.

12.2.5.1 Dworshak Hatchery

12.2.3.1.1 Broodstock History. Dworshak Hatchery began operation in 1969 as mitigation for the impassible Dworshak Dam, located in the lower North Fork Clearwater River (NFCR). The hatchery is funded by the U.S. Army Corps of Engineers, operated by the USFWS and is managed as a harvest augmentation program to mitigate for production losses resulting from construction of the dam. Broodstock for the Dworshak NFH B-Run steelhead program was originally obtained by collecting wild/natural fish returning to the North Fork Clearwater River. The NFCR steelhead are maintained entirely within the hatchery as their historic habitat is no longer accessible. Historically, the North Fork Clearwater River is thought to have produced 50 percent to 60 percent of the steelhead in the Clearwater Basin prior to dam construction (SRHR, 1991).

12.2.3.1.2 Similarity of hatchery-origin to natural-origin fish. Genetics studies indicate that the hatchery stock used in the Dworshak program may be representative of the original North Fork run (BRT 2003). Because the native habitat of this stock is blocked, there is no attempt to maintain the natural source population. Broodstock collection was initiated in 1969, several years before Dworshak Dam was completely closed. No natural fish have been incorporated into the broodstock since about the mid 1980s when all hatchery fish were marked. The spawn timing of hatchery steelhead may have advanced, based on observed differences between steelhead in the hatchery and Lochsa River natural fish spawn timing. However, this change in spawn timing may also be environmental linked to the closing of Dworshak Dam. Water released from the reservoir throughout the winter is much warmer than historically observed in the free flowing North Fork Clearwater River. The number of hatchery fish spawned has been greater than 1,000 steelhead annually and it is unlikely that there has been loss of genetic material from the original North Fork Clearwater 'B' run steelhead (USFWS 2002a). The Dworshak steelhead stock is part of the ESU.

12.2.3.1.3 Program Design. The program is managed as a harvest mitigation program. The smolt release objective is approximately 2.3 million steelhead, with 1.2 million at the hatchery and 1.1 million off-station primarily into the South Fork Clearwater River, Lolo Creek, and Clear Creek.

The hatchery also supplies eggs to the Clearwater River Hatchery for their steelhead program (see below) and outplants surplus adults to streams in hatchery influenced areas.

12.2.3.1.4 Program Performance. This program supports state and tribal fisheries and is self-sustaining. In most years surplus adults are available for release into under seeded habitat. The IDFG and the FWS monitor hatchery performance with tagging, creel census and adult trap returns. There is no information concerning the performance of hatchery fish not released at the hatchery. Table 12.10, summarizes annual adult returns (USFWS 2002a).

12.2.3.1.5 VSP Criteria

<u>Abundance</u> – The hatchery program returns several thousand hatchery adults annually. There is limited information concerning the number of natural adults returning to the Clearwater Basin.

<u>Productivity</u> – The hatchery fish are self sustaining and annually provide several thousand surplus adults for fisheries. Natural fish productivity and the effects of the hatchery program it is unknown.

<u>Diversity</u> – Dworshak Hatchery preserves the remnant genetic material of the steelhead native to the North Fork Clearwater River. It is probable that this gene resource would have been lost without the hatchery program.

<u>Distribution</u> – Natural fish are widely distributed within the Clearwater Basin. The hatchery program is thought to have little effect on distribution.

12.2.3.1.6 Summary. The Dworshak National Fish Hatchery steelhead program supports state and tribal fisheries and has successfully preserved the gene resources of steelhead that once returned to the North Fork Salmon River. The Dworshak Hatchery steelhead have not been identified as straying from their release sites.

12.2.5.2 Clearwater Hatchery

12.2.5.2.1 Broodstock History. The Clearwater Hatchery complex is a LSRCP program and began operation 1992. The LSRCP mitigation objective is to return 14,000 adult steelhead to the Snake Basin (IDFG 2002a). The complex is composed of a central hatchery (Clearwater Hatchery) and two satellite facilities on the Red River and Crooked River (both located in the South Fork Clearwater basin). The Clearwater Hatchery is located at the confluence of the North Fork and main Clearwater Rivers at river kilometer 65 (immediately across the North Fork from Dworshak National Fish Hatchery). The Red River satellite facility is located at river kilometer 27 and the Crooked River satellite facility is located at river kilometer 1 of Crooked River (a tributary to the South Fork Clearwater River at river kilometer 94). The Dworshak Hatchery (discussed above) collects broodstock for and supplies the steelhead eggs used in this program.

12.2.5.2.2 Similarity of hatchery-origin to natural-origin fish. Steelhead used in this program originate from the Dworshak Hatchery, which represents the historic North Fork Clearwater

population. See the Dworshak Hatchery discussion above for detailed information. The Clearwater steelhead are part of the ESU.

Table 12.10. Number of steelhead returning to Dworshak NFH, estimates of hatchery fish harvested, and total hatchery returns to the Clearwater River, Idaho, 1972-2001 (From: Idaho Fishery Resource Office

Annual Report, FY 2001).

Return ¹	Number Back to Dworshak NFH	Estimated Clearwater Sport Harvest ²	Estimated Clearwater Tribal Harvest ³	Unharvested Clearwater Hatchery Fish ⁴	Total Hatchery Fis Returning to Clearwater River
1972-73	9,938	2,068	-	0	12,006
1973-74	7,910	2,320	-	0	10,230
1974-75	1,698	N.S. ⁵	290	0	1,988
1975-76	1,858	N.S.	430	0	2,288
1976-77	3,100	N.S.	410	0	3,510
1977-78	12,272	14,000	$(1000)^6$	0	27,272
1978-79	4,939	4,610	(500)	0	10,049
1979-80	2,519	N.S.	1,250	300	4,069
1980-81	1,968	4,510	(1000)	500	7,978
1981-82	3,054	1,665	(1000)	0	5,719
1982-83	7,672	13,967	(1,500)	0	23,139
1983-84	3,284	6,500	(500)	100	11,384
1984-85	14,018	19,410	(1,500)	2,700	37,628
1985-86	4,462	7,240	1,471	1,800	15,002
1986-87	5,2868	15,679	4,210	3,000	28,175
1987-88	3,764	8,766	1,478	2,000	16,008
1988-89	6,041	11,332	1,242	3,700	22,315
1989-90	10,630	27,952	1,710	3,650	43,9439
1990-91	7,876	12,973	1,211	2,250	24,147
1991-92	3,700	10,416	1,326	1,650	17,092
1992-93	7,900	19,351	1,184	3,368	31,803
1993-94	3,757	14,063	675	1,457	17,096
1994-95	1,394	5,953	730	1,307	9,384
1995-96	4,480	2,139	992	1,315	9,106
1996-97	2,980	4,926	513	779	9,198
1997-98	3,601	7,611	145	479	11,836
1998-99	5,419	8,773	1,007	1,137	16,335
1999-00	2,882	7,177	1,000	720	11,775
2000-01	6,411	12,181	$(1,000)^6$	513	20,105

Return year is from October through May.

²Unless otherwise noted, estimates of sport harvest in the Clearwater River taken from Idaho Department of Fish and Game annual reports.

³Unless otherwise noted, estimates of tribal harvest in the Clearwater River were taken from Nez Perce Tribe Department of Fishery Resource Management annual reports.

⁴Based on return percentage back to hatchery to calculate returning II-salts from upstream releases.

⁵N.S., no sport fishing season.

⁶() guesstimate on tribal harvest by author.

⁷Pettit IDFG, Lewiston, Idaho (personal communication) included an additional 2,000 fish in harvest from Snake River for a total of 15,967.

⁸Ladder was closed for several days due to high number of returns; not a total hatchery return figure.

⁹We believe the sport estimate of 27,953 is about 8,000 too high and the total number of Dworshak steelhead to the Clearwater River was in the range of 32,000 to 35,000.

12.2.5.2.3 Program Design. Clearwater hatchery was designed as an isolated harvest program, but it has also developed supplementation goals. Most of the production is released into the South Fork Clearwater River and tributaries. The planned production is 1,040,000 smolts of which 490,000 are adipose-clipped for released in Clear Creek (Kooskia Hatchery) and South Fork Clearwater, and 550,000 are released without external marks for supplementation in the South Fork Clearwater River and Lolo Creek. The program is designed to spread out the fisheries and supplement target streams. Future plans call for taking broodstock returning to the satellite facilities in the South Fork sub basin.

12.2.5.2.4 Program Performance. Clearwater steelhead contribute to extensive state and tribes fisheries (see Table 12.10 above). There is no adult collection or enumeration at the tributary sites. This combined with the difficulty of conducting spawning ground surveys in the spring limits the evaluation of this hatchery program and the performance is unknown. There have been little or not evaluations relating to the supplementation objectives.

12.2.5.2.5 VSP Criteria

<u>Abundance</u> – Limited monitoring indicates that the hatchery program has increased returns. There is little information concerning naturally fish abundance in the Clearwater Basin.

Productivity – Unknown

<u>Diversity</u> – Unknown

<u>Distribution</u> – The program is designed with reintroduction into the South Fork drainage as a goal. Results are uncertain.

12.2.5.2.6 Summary. The affects and results of the Clearwater Program are not well documented or understood.

12.2.6 Salmon River Basin Artificial Propagation Programs

Steelhead hatchery releases into the Salmon River drainage are under the auspices of two major steelhead hatchery programs, the LSRCP and Idaho Power Company mitigation. The Federal and private mitigation programs are closely related in terms of goals and fish stocks used. In addition, there are state and tribal experimental supplementation programs in the drainage. The LSRCP program goal for the Salmon basin is to annually return 25,000 adult steelhead above Lower Granite Dam from Magic Valley Hatchery and Hagerman NFH, both located in the upper Snake River. The Idaho Power Company mitigation program has a steelhead objective of releasing 400,000 pounds of steelhead smolts (FERC 1980).

The South Fork and Middle Fork Salmon River sub basins have no history of hatchery releases and are managed as natural fish production areas. The Upper Salmon River above the North Fork including the Pahsimeroi and Lemhi Rivers are managed by Idaho as hatchery influenced areas. The Little Salmon River and Lower Salmon River areas have also been managed by Idaho as hatchery influenced areas.

12.2.6.1 Little Salmon River releases

12.2.6.1.1 Broodstock History. The Little Salmon River is a tributary of the Salmon River near Riggins, Idaho. The tributary is managed by Idaho as a terminal, known stock, recreational fishery area for marked hatchery fish. Steelhead from both LSRCP and IPC mitigation programs are released. Fish released in this section are primarily "B" run Dworshak stock (see Dworshak discussion above for stock history), released from Magic Valley Hatchery, and Pahsimeroi or Oxbow (see Pahsimeroi discussion below for stock history) and "A" run fish from IPC's Niagara Springs hatchery. Annual releases total approximately 950,000 smolts. Habitat in the Little Salmon River is limited, the main stem is paralleled by US Highway 95 which has altered much of the riparian habitat. Natural barriers (falls) on the main stem and several major tributaries block fish passage. The available substrate is mostly boulders, bedrock or highway rip-rap.

12.2.6.1.2 Similarity of hatchery-origin to natural-origin fish. The hatchery stocks released in the Little Salmon River are intended to be isolated from natural production areas. The Pahsimeroi (Oxbow) stock is not part of the ESU. The Dworshak "B" run stock is part of the ESU, but is not native to the Salmon River basin. Rapid River upstream of the Rapid River Hatchery has the majority of the natural production potential in the Little Salmon River sub basin. Hatchery-origin steelhead are blocked and removed from the river each year while natural-origin fish are passed above the weir to spawn naturally.

12.2.6.1.3 Program Design. The Little Salmon River program is designed as a terminal fishery area on marked hatchery fish isolated harvest from natural production areas. Approximately 200,000 of the 950,000 steelhead smolts released are unmarked to assure they pass through the recreational fishery and spawn in the main Little Salmon River (2003 U.S. v Oregon Fall Season Agreement). Broodstock for this program are supplied from other hatcheries.

12.2.6.1.4 Program Performance. Hatchery-origin steelhead destined for the Little Salmon River enter the Salmon River in September and October and "stage" in deep holes until the following February or March when they continue migrating toward the release site. These river reaches are paralleled by U. S. Highway 95 and have good public access are subject to recreational fisheries and high harvest rates. The IDFG monitors the fishery program. Table 12.11 summarizes typical Salmon River smolt releases and harvests for three years in the mid 1990s. Return numbers and catch have been considerably higher in some recent years, but the data is not yet available (IDFG 2002b and USFWS 2002b).

12.2.6.1.5 VSP Criteria

<u>Abundance</u> – This hatchery program does not contribute to abundance.

<u>Productivity</u> – The hatchery program is believed to be isolated from natural production areas and having little or no effect on productivity in this ESU.

<u>Diversity</u> – The hatchery program is believed to be isolated from natural production areas and having little or no effect on diversity in this ESU.

Table 12.11. Salmon River Releases and Sport Harvest of "A" Steelhead, 1995 – 1997.

Release	No. Fish	River Releases and Sport Harvest C	Rearing	Est. No.	Hatchery		SAR
Year	Released	Release Site	Hatchery	Harvested	Returns	Total	(#Ret/#Rel)
1001	Iteleasea	Troituge Site	<u>IIIICICI J</u>	<u> 1141 (esteu</u>	<u> </u>	1000	(#Red#Ref)
1997	84,715	Sawtooth Hatchery	MVFH	177	88	265	0.31
1997	601,349	Sawtooth Hatchery	HNFH	1,262	622	1,884	0.31
1997	65,420	Salmon River at Torrey's Hole	HNFH	228	60	288	0.44
1997	154,471	Salmon River at McNabb's Point	MVFH	249	219	468	0.30
1997	75,946	Salmon River at McNabb's Point	HNFH	122	108	230	0.30
1997	150,280	Salmon River at Bruno's Bridge	MVFH	242	214	456	0.30
1997	830,654	Pahsimeroi Hatchery	NSFH	1,433	1,168	2,601	0.31
1997	241,510	Salmon River at Lemhi River	MVFH	595	344	939	0.39
		Salmon River at North Fork Salmon					
1997	134,310	River	MVFH	545	190	735	0.55
1997	137,833	Salmon River at Hammer Creek	NSFH	329	329	658	0.48
1997	29,700	Salmon River at Pine Bar Rapids	NSFH	73	73	146	0.49
1997	342,281	Little Salmon River	HNFH	161	746	907	0.26
		Little Salmon River at Warm Springs					
1997	94,815	Bridge	NSFH	0	162	162	0.17
1997	2,943,284	Subtotal 1997 'A' Releases		5,416	4,323	9,739	0.33
1996	708,109	Sawtooth Hatchery	HNFH	2,141	628	2,769	0.39
1996	66,022	Salmon River at Torrey's Hole	HNFH	201	47	248	0.38
1996	201,968	Salmon River at McNabb's Point	MVFH	800	345	1,145	0.57
1996	207,245	Salmon River at Bruno's Bridge	MVFH	509	306	815	0.39
1996	799,220	Pahsimeroi River at Trap	NSFH	3,842	1,754	5,596	0.70
1996	21,196	Pahsimeroi Ponds	HNFH	102	47	149	0.70
1996	201,212	Salmon River at Lemhi River	MVFH	921	462	1,383	0.69
		Salmon River at North Fork Salmon					
1996	127,708	River	MVFH	997	365	1,362	1.07
1996	106,025	Salmon River at Hammer Creek	NSFH	39	39	78	0.07
1996	30,090	Salmon River at Pine Bar Rapids	NSFH	11	11	22	0.07
1996	529,266	Little Salmon River	HNFH	1,224	1,224	2,448	0.46
1996	158,008	Little Salmon River	NSFH	46	46	92	0.06
1996	3,156,069	Subtotal 1996 'A' Releases		10,833	5,274	16,107	0.51
1995	184,435	Sawtooth Hatchery	HNFH	674	214	888	0.48
1995	500,571	Sawtooth Hatchery (246,302 - PFH)	HNFH	3196	1059	4255	0.85
1995	64,167	Salmon River at Torrey's Hole	HNFH	262	104	366	0.57
1995	207,845	Salmon River at McNabb's Point	MVFH	1,106	414	1,520	0.73
1995	162,870	Salmon River at Bruno's Bridge	MVFH	1,095	440	1,535	0.94
1995	829,278	Pahsimeroi	NSFH	3,890	2,425	6,315	0.76
1995	198,270	Salmon River at Lemhi River	MVFH	1,018	689	1,707	0.86
		Salmon River at North Fork Salmon					
1995	115,050	River	MVFH	934	464	1,398	1.22
1995	97,221	Salmon River at Hammer Creek	NSFH	115	115	230	0.24
1995	29,400	Salmon River at Pine Bar Rapids	NSFH	35	35	70	0.24
1995	131,157	Little Salmon River	NSFH	625	625	1,250	0.95
1995	84,853	Little Salmon River	HNFH	98	98	196	0.23
1995	316,011	Little Salmon River (43,988 - PFH)	HNFH	554	553	1107	0.35
1995	2,921,128	Subtotal 1995 'A' Releases		13,602	7,235	20,83	0.71

<u>Distribution</u> – A small amount of altered habitat with low production potential is lost to the ESU by managing the Little Salmon River as a terminal fishing area.

12.2.6.1.6 Summary. The Little Salmon River program provides terminal fishery opportunity and appears to be an isolated from natural production areas.

12.2.6.2 Pahsimeroi Hatchery Program

12.2.6.2.1 Broodstock History The Pahsimeroi Hatchery steelhead broodstock was founded between 1966 and 1970 by trapping adults at Hells Canyon Dam (HCD) after attempts to maintain fish upstream of the HCD complex failed. The facility is located about 1 mile above the confluence of the Pahsimeroi River with the Salmon River. Annual releases total approximately 900,000 smolts.

12.2.6.2.2 Similarity of hatchery-origin to natural-origin fish. The Pahsimeroi Hatchery stock is not part of the ESU. The relationship between the hatchery-origin and local natural-origin fish from the upper Salmon River is uncertain. In the early years of founding the Pahsimeroi broodstock it is likely that some native fish were incorporated into the broodstock, some hatchery-origin fish were passed to spawn naturally and some juveniles were released in the drainage (IPC 2002). In recent years, natural-origin fish have been passed and hatchery-origin fish have been removed at the weir. No natural fish have been incorporated into the hatchery broodstock since mass marking of hatchery fish in the mid 1980s.

12.2.6.2.3 *Program Design*. The Pahsimeroi Hatchery is designed as a harvest augmentation program. Smolts are released and adults collected at the hatchery. Natural adults are passed above the hatchery to spawn.

12.2.6.2.4 Program Performance. The IDFG monitors angler participation and harvest in the steelhead recreational fishery (see Table 12.11 above). The program contributes to both state and tribal fisheries. There is little or no information on whether Pahsimeroi Hatchery fish are straying other areas in the upper Salmon River.

12.2.6.2.5 VSP Criteria

Abundance – This hatchery stock is not part of the ESU and does not contribute to abundance.

<u>Productivity</u> – The hatchery program returns sufficient fish to maintain the program. It is unknown what effect this program has on productivity of this ESU.

<u>Diversity</u> – The effects of this program on diversity in the ESU is unknown. Additional monitoring and evaluation is needed for this program to confirm it is operating isolated from the ESU. Release of this hatchery stock throughout the upper Salmon River in the early years of the program may have affected diversity, but specific information to confirm this is not available.

Distribution – The current hatchery program is believed to have no effect on distribution.

12.2.6.2.6 Summary. The program has supported recreational and tribal fisheries since the 1970s. The relationship between the Pahsimeroi hatchery-origin fish and local natural-origin steelhead throughout the upper Salmon River subbasin is uncertain.

12.2.6.3 East Fork Salmon River Local Stock Experiment

12.2.6.3.1 Broodstock/Program History. This is a new program started by trapping natural steelhead returning to the East Fork Salmon River trap in BY 2001. The genetic history of these natural fish is uncertain, and may reflect past hatchery releases, the native stock or some combination (IDFG 2002c). Few natural fish are present in the East Fork (Table 12.12)

Table 12.12. East Fork Salmon River weir information	.(IDFG	2002c).
---	--------	---------

Return	No. of unmarked	No. of unmarked	No. of unmarked	No. of unmarked
Year	female steelhead	female steelhead	male steelhead	male steelhead
	trapped	spawned	trapped	spawned
2000	4	0	2	0
2001	8	3	3	3*
2002	19	10	8	8*

^{*} All males released after partial milt harvest.

12.2.6.3.2 Program Design. The East Fork Salmon River natural steelhead program is an Integrated Recovery Program. It was designed as small-scale supplementation experiment to spawn a portion of locally returning, naturally produced steelhead. Sufficient broodstock are collected (when adult return numbers are adequate) to produce up to 50,000 smolts. Spawning takes place at the East Fork Salmon River satellite facility operated by the Sawtooth Fish Hatchery. Egg incubation through the eyed stage of development occurs at the Sawtooth Fish Hatchery. Eyed-eggs are then shipped to the Magic Valley Fish Hatchery. Natural steelhead smolts are released in the vicinity of East Fork Salmon River trap.

12.2.6.3.3 Similarity of hatchery-origin to natural-origin fish. The program fish are currently all progeny of natural-origin parents selected randomly at the trap site and should be genetically similar to the natural population. However, because of possible past hatchery influence, there may be some divergence from the native stock.

12.2.6.3.4 Program Performance. To date the program has released very small numbers of smolts, only about 15,000, 32,000 and 50,000 each of the 2001, 2002, and 2003 broodyears and has not yet reported adult returns (Brent Snyder, Sawtooth hatchery Manager, personal communication)

12.2.6.3.5 VSP Criteria

<u>Abundance</u> - This program is an experiment designed to test the affects of a small supplementation program on abundance of natural fish.

<u>Productivity</u> - The experimental design may provide information regarding affect on productivity.

Diversity – Unknown.

Distribution – Unknown.

12.2.6.4 Salmon River B-Run Program

12.2.6.4.1 Broodstock History. This program was founded in the early 1980's, from Dworshak Hatchery steelhead (see Dworshak Hatchery discussion above). Dworshak Hatchery continues to provide broodstock for this program. Broodstock are also collected at Sawtooth Fish Hatchery's East Fork Salmon River Satellite and Squaw Creek Pond facility (also located on the East Fork), but returns have been insufficient to maintain the program. Eggs produced from adults collected at the Squaw Creek Pond site or the East Fork Salmon River Satellite are transferred to Sawtooth Fish Hatchery for incubation through the eyed stage of development. Eyed-eggs are then transferred to Magic Valley Fish Hatchery, with any production short-fall made up with eyed eggs from the Dworshak Hatchery program.

12.2.6.4.2 Similarity of hatchery-origin to natural-origin fish. The B-run hatchery stock originated from Dworshak Hatchery and is part of the ESU, however, this hatchery stock is not native to the Salmon River basin.

12.2.6.4.3 Program Design. The Salmon River B-run steelhead program was designed as harvest augmentation program. The original management intent was to establish a "B" run steelhead stock for the upper Salmon River without continual infusion from Dworshak Hatchery. However, this objective has not been met. Approximately 270,000 B-run steelhead smolts are released from the Squaw Creek acclimation pond and up to 225,000 are released into the lower East Fork Salmon River from fish that returned to the East Fork Salmon River Satellite.

12.2.6.4.4 Program Performance. The IDFG monitors angler participation and harvest in the steelhead recreational fishery (see Table 12.11 above). The program contributes to both state and tribal fisheries. There is little or no information on whether these B run hatchery fish are straying to other areas in the upper Salmon River. Estimated smolt-to-adult survival rates are not available for the Salmon River B-run steelhead program. Hatchery-produced adult return information is presented below for the East Fork Salmon River Satellite and Slate Creek/Squaw Creek Pond collection sites (Tables 12.13 and 12.14).

12.2.6.4.5 VSP Criteria

<u>Abundance</u> – Abundance of hatchery B run hatchery steelhead has been increased, although the Dworshak stock used is not native to the upper Salmon River. Natural fish abundance in the upper Salmon River is low.

<u>Productivity</u> – It is unknown what effect this program may have on natural fish productivity. The hatchery program does not return enough adults to sustain the program.

<u>Diversity</u> – Widespread use of the Dworshak B-run stock could be a risk for genetic introgression and loss of natural diversity. The actual effects of the program are unknown.

Table 12.13. East Fork Salmon River B-run steelhead adult returns.

Return Year	Total Returns (Hatchery-Produced/Natural)	Total Ponded (H/N)	Total Released (H/N)	Total Male Returns (H/N)	Total Female Returns (H/N)
1991	136 (115/21)	85 (85/0)	51 (30/21)	92(80/12)	44 (35/9)
1992	156 (111/45)	90 (90/0)	66 (21/45)	91(68/23)	65 (43/22)
1993	176 (159/17)	100 (100/0)	76 (59/17)	99 (91/8)	77 (68/9)
1994	73 (65/8)	63 (63/0)	10 (2/8)	43 (40/3)	30 (25/5)
1995	38 (36/2)	32 (32/0)	6 (4/2)	21 (21/0)	17 (15/2)
1996	54 (48/6)	47 (47/0)	7 (1/6)	32 (28/4)	22 (20/2)
1997	149 (137/12)	129 (129/0)	20 (8/12)	61 (55/6)	88 (82/6)
1998	27 (13/14)	10 (10/0)	17 (3/14)	12 (10/2)	15 (3/12)
1999	56 (46/10)	38 (38/0)	18 (8/10)	33 (30/3)	23 (16/7)
2000	48 (42/6)	42 (42/0)	6 (6/0)	26 (24/2)	22 (18/4)
2001	62 (51/11)	52 (49/3)	10 (2/8)	25 (22/3)	37 (29/8)
2002	38 (11/27)	21 (11/10)	17 (0/17)	19 (11/8)	19 (0/19)

Table 12.14. Squaw Creek/Pond and Slate Creek B-run steelhead adult returns.

Return Year	Total Returns (Hatchery- Produced/Natural)	Total Ponded (H/N)	Total Released (H/N)	Total Male Returns (H/N)	Total Female Returns (H/N)
1996 Slate Cr.	38 (37/1)	22 (22/0)	16 (15/1)	15 (14/1)	23 (23/0)
1997 Slate Cr.	13 (13/0)	13 (13/0)	0	7 (7/0)	6 (6/0)
1998 Slate Cr.	5 (5/0)	5 (5/0)	0	4 (4/0)	1 (1/0)
1999	Not operated - n/a	n/a	n/a	n/a	n/a
2000 Squaw Cr.	1 (1/0)	1 (1/0)	0	1 (1/0)	0
2001 Squaw Cr.	4(4/0)	0	4 (4/0)	3 (3/0)	1 (1/0)
2002 Squaw Cr.	166 (158/8)	32 (32/0)	134 (126/8)	107 (102/5)	59 (56/3)

<u>Distribution</u> – The effects on distribution are unknown.

12.2.6.4.6 Summary. The Salmon River B-run hatchery steelhead program contributes to recreational fisheries and tribal fisheries. Attempts to found a localized broodstock appear to be progressing slowly. The overall affect of this program on the ESU is unknown.

12.2.6.5 Sawtooth Hatchery Steelhead

12.2.6.5.1 Broodstock History. The Sawtooth stock originated from fish transferred from Pahsimeroi Hatchery (see Pahsimeroi discussion above) in the early 1980s. The two stocks have been managed separately for the past 15 years. Broodstock are collected at Sawtooth Hatchery with rearing occurring at Hagerman NFH and Magic Valley, both located in the upper Snake River.

12.2.6.5.2 Similarity of hatchery-origin to natural-origin fish. The Sawtooth stock is intended to be isolated and is not part of the ESU. The relationship between the hatchery stock and the local natural-origin fish is uncertain. In the early years of founding the Pahsimeroi broodstock it is likely that some native upper Salmon River fish were incorporated, some hatchery-origin fish were passed to spawn naturally, and some juveniles were released in the drainage. Pahsimeroi adults and smolts were released upstream from Sawtooth Hatchery prior its construction and it is likely that some returned to spawn naturally. In recent years, natural-origin fish have been passed and hatchery-origin fish have been removed at the weir.

12.2.6.5.3 Program Design. The Sawtooth program is designed as a harvest augmentation program that contributes to state and tribal fisheries. Returning hatchery adults are prevented from passing Sawtooth Hatchery. Smolts are released directly from the Sawtooth Hatchery and direct stream releases into the mainstem Salmon River upstream of the Lemhi River (see discussion below on main stem releases). Annual releases total approximately 700,000 smolts (IDFG 2002b and USFWS 2002b). Currently, program steelhead are also released into Valley Creek (30,000), Yankee Fork (330,000), and Lemhi River (120,000 Pahsimeroi stock) to supplement those streams.

12.2.6.5.4 Program Performance. The IDFG monitors angler participation and harvest in the steelhead recreational fishery (see Table 12.11 above). The program contributes to both state and tribal fisheries. There is little or no information on whether these hatchery fish are straying to other areas in the upper Salmon River. Table 12.15 summarizes adult return information to the Sawtooth Hatchery program (IDFG 2002e)

12.2.6.5.5 VSP Criteria

<u>Abundance</u> – The Sawtooth stock does not contribute to abundance of the ESU. Natural fish are present in the upper Salmon River in low numbers and has an uncertain heritage with regard to local natural-origin fish.

<u>Productivity</u> – The program is self supporting, but is not part of the ESU. It is unknown what effect the hatchery program is having on natural fish.

 Table 12.15.
 Sawtooth Fish Hatchery A-run steelhead adult return history.
 All natural fish are released

upstream to spawn.

Return Year	Total Returns (Hatchery-Produced/Natural)	Total Ponded	Total Released	Total Male Returns	Total Female Returns
1991	261 (249/12)	170	91	213	48
1992	1,705 (1,661/44)	1,051	654	1,206	499
1993	1,591 (1,584/7)	923	668	1,154	437
1994	338 (332/6)	278	60	174	164
1995	532 (528/4)	434	98	379	153
1996	553 (545/8)	499	54	299	254
1997	1,243 (1,229/14)	1,089	361	767	476
1998	768 (762/6)	615	153	506	262
1999	933 (923/10)	869	64	529	404
2000	2,061 (2,046/15)	1,866	195	1,082	979
2001	3,055(3,018/37)	1,649	1,406	1,689	1,366
2002	7,104(7,009/95)	5,809	1,295	3,499	3,605

<u>Diversity</u> – The effects of this hatchery program on steelhead diversity in the upper Salmon River is unknown. Recent genetic information for upper Salmon River steelhead shows the Lemhi River population to be different from the hatchery stocks (Nielson, 2004). Continued hatchery releases of Pahsimeroi stock into the Lemhi River poses significant risks to steelhead diversity within that watershed. Genetic information for natural fish in Yankee Fork and Valley Creek are not available, but potential pose similar risks. Only natural fish are passed above Sawtooth Hatchery and the current hatchery program is thought to have little or not effect on steelhead above the hatchery. There is considerable uncertainty regarding the genetic relationship between the hatchery and natural fish given the long history of programs in the upper Salmon River.

<u>Distribution</u> – Natural fish are widely distributed in low numbers. The hatchery program is believed to have little effect on distribution of fish within the ESU.

12.2.6.5.6 Summary. The Sawtooth Hatchery program contributes to recreational and tribal fisheries. It is unknown if straying to nearby streams is occurring. However, continued releases into the Lemhi River poses significant risks to diversity in that population. The relationship between the Sawtooth and Pahsimeroi hatchery-origin fish and local natural-origin steelhead throughout the upper Salmon River subbasin is uncertain.

12.2.6.6 Upper Salmon main stem releases

12.2.6.6.1 Broodstock History. Sawtooth and Pahsimeroi Hatchery stock (see discussion above history of those broodstocks) are released into several sites on the main stem Salmon River above Lemhi River.

12.2.6.6.2 Similarity of hatchery-origin to natural-origin fish. The fish released in this program originate in the Sawtooth and Pahsimeroi programs and are not part of the ESU. The founding source for these hatchery stocks are believed to be from trapping at IPC's Hells Canyon hydroelectric complex and incorporation of natural fish from the Pahsimeroi River (see Pahsimeroi Hatchery discussion above). Currently, natural fish are not incorporated into either of the hatchery stocks.

12.2.6.6.3 Program Design. This program is intended to augment and disperse the fisheries in the upper Salmon River. In the mid 1990s, these steelhead releases were moved lower in the main Salmon River (from the Sawtooth Hatchery area) to reduce the potential for predation and competition on listed spring/summer chinook salmon. The releases are made in main-stem locations believed to have little or no natural steelhead production potential. It is unclear how complete the separation is between natural and hatchery fish. The current monitor program is not designed to provide this information. These main stem releases are generally considered to occur in the migration corridor and not natural steelhead production areas. Annual releases total approximately 600,000 smolts.

12.2.6.6.4 Program Performance. The IDFG monitors angler participation and harvest in the steelhead recreational fishery (see Table 12.11 above). The program contributes to both state and tribal fisheries. There is little or no information on whether these hatchery fish are straying to other areas in the upper Salmon River. It is unknown whether or not hatchery fish that escape the fisheries stray and intermingle with natural fish in the tributary spawning areas.

12.2.6.6.5 VSP Criteria

<u>Abundance</u> – The hatchery stocks used in this program are not part of the ESU and do not contribute its abundance.

<u>Productivity</u> – It is unknown what effect the hatchery program has on natural fish productivity.

<u>Diversity</u> – The effects of this hatchery program on steelhead diversity in the upper Salmon River is unknown. Enhanced monitoring is needed to determine whether or not hatchery steelhead are straying into tributary streams and intermingling with natural fish.

<u>Distribution</u> – Natural steelhead are widely distributed in low numbers. The hatchery program is believed to have a neutral effect on distribution of steelhead in the ESU.

12.2.6.6.6 Summary. This program is designed to disperse hatchery-origin adult returns and angling pressure in the upper main stem Salmon River. It is unknown on complete the separation is between hatchery and natural fish.

12.2.6.7 Shoshone-Bannock supplementation releases

12.2.6.7.1 Broodstock History. The Shoshone-Bannock Tribes (SBT) fishery department has conducted an eyed egg program in the upper Salmon River tributaries since 1997. Current release targets are approximately 1 million eggs into as many as 22 different streams upstream

from the Middle Fork Salmon River. Eggs are provided from Sawtooth and Pahsimeroi Hatchery programs.

- 12.2.6.7.2 Similarity of hatchery-origin to natural-origin fish. Eggs used in this program are not derived from the targeted release streams, but are from Sawtooth and Pahsimeroi Hatchery stocks which are not part of the ESU.
- 12.2.6.7.3 *Program Design*. The SBT egg box program is designed to supplement the targeted streams with Sawtooth and Pahsimeroi Hatchery stocks. The program is designed to allow natural selection to apply beginning with hatching of eggs with the intent of producing adults that are more successful reproducing naturally.
- 12.2.6.7.4 Program Performance. No evaluation has been conducted on the performance of this program. The SBT have indicated anecdotally that some adult fish are returning to areas where steelhead eggs were released.

12.2.6.7.5 VSP Criteria

<u>Abundance</u> – The hatchery stocks used in this program are not contributing to ESU abundance. Anecdotal information from the SBT indicates that some adults are returning to project areas, but the hatchery stocks used are not part of the ESU.

<u>Productivity</u> – No information is available.

<u>Diversity</u> – Recent genetic information has shown that Lemhi and Pahsimeroi River steelhead are different than the hatchery stock used in this program (Nielsen, 2004). Similar genetic information for other tributaries is not available, however, analysis of additional steelhead samples is pending. The current information seems to indicate that some upper Salmon River steelhead stock structure may still persist. The widespread dispersion of the Sawtooth and Pahsimeroi Hatchery stocks may pose major risks to what diversity remains in the upper Salmon River.

<u>Distribution</u> – This program distributes steelhead into numerous streams, but uses hatchery stocks not part of the ESU.

12.2.6.7.6 Summary. The widespread use of Pahsimeroi and Sawtooth stocks in supplementation experiments poses risks to remaining stock structure in the upper Salmon River. Anecdotal information from the SBT indicates some adults are returning to release areas.

12.2.7 Snake River at Hells Canyon Dam

12.2.7.1 Oxbow Hatchery Program

12.2.7.1.1 Broodstock History. The original stock for Pahsimeroi Hatchery was natural fish trapped at Hells Canyon Dam between 1966 and 1970 (see Pahsimeroi discussion above). For approximately 10 years, steelhead were not released at Hells Canyon Dam. Following the 1980

Settlement agreement with IPC, Pahsimeroi Hatchery steelhead were used to initiate smolt releases at Hells Canyon Dam on the Snake River (FERC 1980). Since about 1984, the broodstock for this program has been obtained from returns returning to Hells Canyon Dam and has been designated the "Oxbow" stock.

12.2.7.1.2 Similarity of hatchery-origin to natural-origin fish. The Oxbow hatchery stock is most similar to the Pahsimeroi hatchery stock and may represent some divergence from the native, indigenous stock of Hells Canyon tributaries. Tributary spawning habitat in the reach below Hells Canyon Dam is limited by the small size and high gradient of the streams. There are a few steelhead spawning in the lower reaches of the tributaries below Hells Canyon Dam, but it is uncertain if these represent remnant native stock or are progeny of the Oxbow hatchery fish. Hatchery-origin steelhead are blocked and removed from the river each year and fewer than 10 natural-origin fish are observed annually. Natural fish are not incorporated into the hatchery broodstock.

The 1996 BRT determined that the Oxbow stock should be included in the ESU and was the remnant of steelhead genetics that once migrated to tributaries upstream from Hells Canyon Dam..

12.2.7.1.3 Program Design. The Snake River at Hells Canyon Dam program is designed as an isolated harvest of known-stock, marked hatchery-origin steelhead that are dead-ended in the area below a barrier. Annual releases total approximately 525,000 smolts.

12.2.7.1.4 Program Performance. Angler participation and harvest is monitored by IDFG and by ODFW for Oregon license-holders. The program supports state and tribal fisheries.

12.2.7.1.5 VSP Criteria

<u>Abundance</u> – This stock is believed to have originated from the upper Snake River above the Hells Canyon hydroelectric complex. The stock was transferred to Pahsimeroi Hatchery and then returned to the Snake River. The current Oxbow stock has an uncertain heritage with regard to local natural-origin fish or the pre-dam native fish. The program does not contribute to abundance of the ESU.

Productivity – N/A

<u>Diversity</u> – N/A – Believed to be neutral, but this stock could either be representative of the remnant stock from Hells Canyon, related to upper Salmon River natural fish, or a threat to diversity because of domestication.

Distribution - N/A.

12.2.7.1.6 Summary. The Oxbow Hatchery steelhead program is a direct descendants of the Pahsimeroi, which was originally founded from native fish trapped in Hells Canyon. However, in 30 years of transfers and possible inclusion of other stocks, may have substantially diverged from the original stock in the founding source. The program supports state and tribal fisheries

since the 1980s. Generally, this is a successful isolated harvest program. Any fish that are not caught or taken as broodstock are blocked in the deep canyon and not likely to find a successful spawning site.

12.3 Conclusions

Existing Status: Threatened **BRT Finding**: Threatened **Recommendation**: Threatened

12.3.1. ESU Overview

12.3.1.1 History of Populations

The original number of populations of *O. mykiss* in the Snake River Basin and the relationship of historic populations to the current ESU is unknown (Kostow 2003). Numerous populations may have once spawned upstream from Hells Canyon Dam.

The Interior Columbia Technical Review Team has identified 25 remaining populations remaining in this ESU (see Table 12.1 above).

12.3.1.2 Association Between Natural Populations and Artificial Propagation

Natural populations "with minimal genetic contribution from hatchery fish"

There are 13 natural populations which have no direct hatchery influence: Asotin Creek, Lower Clearwater River A-run, Selway River, Lochsa River, Joseph Creek, Upper Grande Ronde River, South Fork Salmon River, Secesh River, Chamberlain Creek, Lower Middle Fork Salmon River, Upper Middle Fork Salmon River, Panther/Owl Creek, and North Fork Salmon River. In addition there are a number of subbasins which are not identified as independent populations, but which support significant numbers of natural steelhead without hatchery influence. Examples include Wenaha River, Catherine Creek and Lookingglass Creek (in the Grande Ronde Basin), Lostine and Minam Rivers (in the Wallowa subbasin), Rapid River (in the Little Salmon River subbasin), and above hatchery weirs on Pahsimeroi River and Upper Salmon River.

Natural^a populations "that are stable or increasing, are spawning in the wild, and have adequate spawning and rearing habitat" ^b

Data on most steelhead populations are not available and is difficult to collect except for a few tributary traps. Many natural steelhead populations are reported to persist in a stable, but depressed population abundance in Snake River

^a See HLP for definition of natural, mixed and hatchery populations

^b HLP Point 3

tributaries (Chilcote 1998)

Mixed (Integrated Programs^c)

Five populations have associated hatchery programs that supplement natural spawning, including: Tucannon River, South Fork Clearwater River, Lolo Creek, East Fork Salmon River, and Imnaha River (Little Sheep Creek).

Hatchery (Isolated^d)

Isolated, harvest augmentation hatchery programs are located within the geographic bounds of eight of the populations, including: Tucannon River, Lower Grande Ronde River, Wallowa River, Little Salmon River, Pahsimeroi River, Upper Main Salmon River, and Snake River Hells Canyon. Dworshak Hatchery is unique, in that the entire North Fork Clearwater River population resides in hatcheries and is managed primarily as a harvest augmentation program.

12.3.2 Summary of ESU Viability:

12.3.2.1 Abundance. The BRT assigned a moderately high risk factor to Abundance, based on the average abundance of natural steelhead falling to less than 10% of historic numbers through most of the 1990s. Naturally-produced fish for the total ESU have demonstrated generally increased abundance since the ESU was listed in 1997, with the 2001-2003 lower Granite Dam count averaging approximately 40,000 adult natural steelhead compared to fewer than 8,000 between 1993-1997. Recent population response to environmental conditions and management actions have increased annual counts to around 40% of the 1960s base counts. While the short-term increase in abundance is encouraging, long-term abundance trends are uncertain.

12.3.2.2 Productivity. The BRT rated Productivity as a high risk factor (BRT 2003). Natural steelhead populations appeared to be stable, but at low population numbers due to productivity that fell short of parent replacement during the 1970s through the 1990s. The large number hatchery fish released into the Snake Basin (many using hatchery stocks not included in the ESU) poses risks to productivity and is an area of concern. Hatchery stocks that have been propagated for a number of years are self-sustaining, while it is to early to determine if new programs (Tucannon River and East Fork Salmon River) will also be self-sustaining.

12.3.2.3 Spatial Structure. The BRT rated spatial structure as a low to moderate risk factor based on a large number of persistent and well distributed natural populations throughout the

^c Integrated programs follow practices designed to promote and protect genetic diversity and only use fish from the same local population for broodstock (both natural-origin fish, whenever possible, and hatchery-origin fish derived from the same local population and included in the ESU). Programs operated to protect genetic diversity in the absence of natural-origin fish (e.g., captive broodstock programs and the reintroduction of fish into vacant habitat) are considered "integrated".

d Isolated programs do not follow practices designed to promote or protect genetic diversity. Fish that are reproductively isolated are more likely to diverge genetically from natural populations included in the ESU and to be excluded themselves from the ESU.

remaining habitat of this ESU (BRT 2002). Hatchery programs have little effect of spatial structure as natural steelhead are already well distributed.

12.3.2.4 Diversity. The BRT rated diversity as a high risk factor based on the large number of hatchery-origin steelhead, many of which are not part of the ESU. The widespread release of the Pahsimeroi and Sawtooth Hatchery stocks (both not part of the ESU) throughout much of the upper Salmon River is an ongoing risk to the remaining diversity in that area. Use of Wallowa Hatchery stock (not part of the ESU) in the Grande Ronde Basin is also an area of concern, however, monitoring indicates that straying to natural production areas away from the release locations is not occurring. Enhanced monitoring of Salmon River programs is needed to assess whether or not hatchery fish are intermingling with natural populations.

12.3.3. Artificial Propagation Record

- **12.3.3.1** Experience with Integrated Programs. Dworshak Hatchery has successfully maintained the North Fork Clearwater Population in captivity since about 1970. Imnaha (Little Sheep Creek) program has operated as an integrated program since 1982. Tucannon and East Fork Salmon River programs started with BY 2001 and 2002.
- **12.3.3.2 Are Integrated Programs Self-Sustaining**. Dworshak and Imnaha (Little Sheep Creek) programs are self-sustaining and return adults in numbers sufficient to support fisheries and outplant to under seeded habitats. The Tucannon River and East Fork Salmon River programs are to new to determine whether they are self-sufficient.
- **12.3.3.3 Certainty that Integrated Programs will Continue to Operate**. There is a high certainty that these hatchery program will continue. Each of the propagation programs in this ESU have long-term agreements and stable funding. Monitoring and evaluation supporting effective adaptive management are strengths of these propagation programs.

12.3.4. Summary of Overall Extinction Risk Faced by the ESU:

No populations in this ESU are in immediate risk of extinction. Populations that have abundance records and the ESU as a whole has demonstrated positive population growth and improved productivity in the past three to four years. Total returns of fish and returns of natural-origin fish only, have increased since 2001. However, overall abundance is still less that the approximately 70,000 average 1962 and 1972 (Busby et al 1996) and the longer term trend in productivity and abundance are uncertain. Concern remains for low productivity if environmental conditions revert to the mid-1990s. Habitat loss and the large number of non-ESU hatchery-origin steelhead released in this ESU continue to be concerns.

12.4 LITERATURE CITED

BRT (Biological Review Team) 2003. Preliminary Conclusions on the Updated Status of Listed ESUs of West Coast Salmon and Steelhead. Review Draft report Northwest Fishery Science Center, Seattle, Washington February 2003.

Busby, P.J., T.C. Wainwright, G.J. Bryant, L.J. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon and California. NOAA Tech. Memo. NMFS-NWFSC-27.

Chilcote, M. 1998. Conservation Status of Steelhead in Oregon. Oregon Department of Fish and Wildlife. Portland, Oregon

FERC (Federal Energy Regulatory Commission) 1980. Order approving an uncontested offer of settlement (Hells Canyon Settlement Agreement) Docket No. E 9579. February 27, 1980.

IDFG (Idaho Department of Fish and Game) 2002a. Hatchery and Genetic Management Plan for Clearwater River Basin B-run steelhead (Clearwater Hatchery). IDFG, Boise, Idaho September 2002

IDFG (Idaho Department of Fish and Game) 2002b. Hatchery and Genetic Management Plan for Salmon River A-run steelhead Sawtooth/Magic Valley. IDFG, Boise, Idaho September 2002

IDFG (Idaho Department of Fish and Game) 2002c. Hatchery and Genetic Management Plan for East Fork Salmon River Natural Steelhead. IDFG, Boise, Idaho. September 2002.

IDFG (Idaho Department of Fish and Game) 2002d. Hatchery and Genetic Management Plan for Salmon River B-run steelhead. IDFG, Boise, Idaho September 2002

IHOT (Integrated Hatchery Operations Team). 1995. Policies and procedures for Columbia Basin anadromous salmonid hatcheries. Annual Report 1994. BPA, Portland, OR. Project No. 92-043, January 1995. DOE/BP-60629. 115 p.

IPC (Idaho Power Company) 2002. Technical Appendices for New License Application, Hells Canyon Hydroelectric Project, FERC project No. 1971. Boise, Idaho September 2002.

JCRMS (Joint Columbia River Management Staff. 2004. Joint Staff Report Concerning Commercial Seasons for Spring Chinook, Steelhead, Sturgeon, Shad, Smelt, and Other Species and Miscellaneous Regulations for 2004. 69p.

Lohn, D.R. 2002. Interim Abundance and Productivity Targets for Interior Columbia Basin Salmon and Steelhead Listed Under the Endangered Species Act (ESA). Letter to Frank L. Cassidy, Jr., Chairman, Northwest Power Planning Council, dated April 4, 2002, including 10 page attachment.

LSRCP (Lower Snake River Compensation Plan) 1998. Proceedings of the Lower Snake River Compensation Plan Status Review Symposium. U.S. Fish and Wildlife Service, LSRCP Office, September 1998, Boise Idaho. 276 p

Mallet, J. 1974. Inventory of salmon and steelhead resources, habitat, use and demands. Idaho Department of Fish and Game, Federal Aid in Fish Restoration, Project F-58-R-1, Job Performance Report, Boise, Idaho.

Nielson, Jennifer L., and four other authors 2004. Genetic Population Structure for Snake River Basin Steelhead in Idaho. Interim Report for Idaho Supplementation Studies. IDFG Fishery Bureau January 2004.

ODFW (Oregon Department of Fish and Wildlife) 2002a. Hatchery and Genetic Management Plan for Grande Ronde Basin Summer Steelhead Program (Wallowa/Irrigon). Oregon Department of Fish and Wildlife, Salem, Oregon September 2002

ODFW (Oregon Department of Fish and Wildlife) 2002b. Hatchery and Genetic Management Plan for Imnaha River Basin Summer Steelhead Program. Oregon Department of Fish and Wildlife, Salem, Oregon September 2002

ODFW, CTUIR and NPT. 2004. Lower Snake River Fish and Wildlife Compensation Plan Grande Ronde and Imnaha Basins Annual Operation Plan . ODFW, LaGrande, OR February 2004

RASP. 1992. Supplementation in the Columbia Basin: Summary report series, final report, December 1992, Parts I-IV. Bonneville Power Administration, Portland, Oregon

Snake River Hatchery Review (SRHR). 1991. Snake River HatcheryReview, 1990 Workshop Summary, Compiled by Lower Snake River Compensation Office.

TRT (Interior Columbia Basin Technical Review Team) 2003. Preliminary report identifying salmon and steelhead populations in the Snake River Basin. Northwest Fishery Science Center, October 2003.

WDFW (Washington Department of Fish and Wildlife) 2002a. Hatchery and Genetic Management Plan for Snake River Summer Steelhead Program (Lyons Ferry Hatchery). Washington Department of Fish and Wildlife, Olympia, Washington. September 2002.

WDFW (Washington Department of Fish and Wildlife) 2002b. Hatchery and Genetic Management Plan for Tucannon River Summer Steelhead Program (Lyons Ferry Hatchery). Washington Department of Fish and Wildlife, Olympia, Washington. September 2002.

WDFW (Washington Department of Fish and Wildlife) 2002c. Hatchery and Genetic Management Plan for Tucannon River Native Summer Steelhead Program (Lyons Ferry Hatchery). Washington Department of Fish and Wildlife, Olympia, Washington. September 2002.

WDFW (Washington Department of Fish and Wildlife) 2002d. Hatchery and Genetic Management Plan for Grande Ronde River Summer Steelhead Program (Lyons Ferry Hatchery/Cottonwood Pond). Washington Department of Fish and Wildlife, Olympia, Washington. September 2002.

WDFW (Washington Department of Fish and Wildlife) 2002e) Fishery Management and Evaluation Plan - WDFW Recreational Fisheries in the Snake River Mainstem and Tributaries That May Impact Snake River Basin Steelhead, Snake River Spring/Summer Chinook, Snake River Fall Chinook, and Snake River Sockeye ESUs. Washington Department of Fish and Wildlife, Olympia, Washington.

WDFW 2004. Columbia River Fish Runs and Fisheries. WDFW internet site http://wdfw.wa.gov/

USFWS (United States Fish and Wildlife Service) 2002a. Hatchery and Genetic Management Plan for Dworshak National Fish Hatchery, B-run Summer Steelhead Program. U.S. Fish and Wildlife Service, Dworshak Fishery Resource Office, Orofino, Idaho. September 2002

USFWS (United States Fish and Wildlife Service) 2002b. Hatchery and Genetic Management Plan for Hagerman National Fish Hatchery, Summer Steelhead Program. U.S. Fish and Wildlife Service, Lower Snake River Compensation Plan Office. September 2002